


2:2 Cell Parts and Their Jobs

PREPARATION

Materials Needed

 Make copies of the Skill, Study Guide, Application, Reteaching, and Lab worksheets in the *Teacher Resource Package*.

► Have methylene blue stain and gather *Elodea* and toothpicks for Lab 2-2.

Key Science Words

cell membrane	ribosome
nucleus	mitochondria
nuclear membrane	vacuole
nucleolus	centriole
chromosome	chloroplast
cytoplasm	cell wall

Process Skills

In Lab 2-2, students will observe, compare, and use a microscope.

1 FOCUS

► The objectives are listed on the student page. Remind students to preview these objectives as a guide to this numbered section.

MOTIVATION/Bulletin Board

Make a bulletin board showing the parts of an animal cell and a plant cell. As each cell part is studied, identify the part by placing its label on the bulletin board.

Guided Practice

Have students write down their answers to the margin question: cytoplasm.

ASSESSMENT

Oral: Ask students what would happen to a cell if the nucleus became damaged. (The cell would no longer function correctly because the nucleus controls all the activities of the cell.)

Objectives

4. **List** the parts of the cell.
5. **Describe** the functions of the cell parts.

Key Science Words

cell membrane
nucleus
nuclear membrane
nucleolus
chromosome
cytoplasm
ribosome
mitochondria
vacuole
centriole
chloroplast
cell wall

2:2 Cell Parts and Their Jobs

Cells are microscopic units that make up all living things. Cells are alive. They do everything needed to stay alive. They carry on cellular respiration. They grow and reproduce. A cell has many different parts to do all of these jobs. As you study the parts of the cell, refer to Figure 2-7. Figure 2-7 shows an animal cell and a plant cell and the cell parts of each.

Cell Membrane and Nucleus

All cells are surrounded by a cell membrane. The **cell membrane** gives the cell shape and holds the cytoplasm. It also helps control what moves into and out of the cell.

The **nucleus** is the cell part that controls most of the cell's activities. It determines how and when proteins will be made. Proteins are complex substances with several different jobs. Some form cell parts. Others regulate activities of the cell. The nucleus also passes traits from parents to offspring.

The **nuclear membrane** is a structure that surrounds the nucleus and separates it from the rest of the cell. The nuclear membrane has openings that allow certain materials to move into and out of the nucleus.

Inside the nucleus is a smaller body called the nucleolus (new KLEE uh lus). The **nucleolus** is the cell part that helps make ribosomes (RI buh sohmz). You will read about ribosomes in the next section. Some cells have more than one nucleolus.

Also inside the nucleus are threadlike structures called chromosomes (KROH muh sohmz). **Chromosomes** are cell parts with information that determines what traits a living thing will have. Examples of traits are hair color, eye color and sizes and shapes of leaves.

Cytoplasm

The clear, jellylike material between the cell membrane and the nucleus that makes up most of the cell is called **cytoplasm** (SITE uh plaz um). Most of the cell's chemical reactions take place in the cytoplasm. Cytoplasm is mostly water, but it also has other chemicals. In addition, other cell parts that carry on special functions are found in the cytoplasm.

What is found between the cell membrane and the nucleus?

OPTIONS

Science Background

The nucleus determines which proteins will be made and when. Proteins, in turn, regulate most of the other chemical processes in the cell. In this way, the nucleus controls cell activity. Not all cells have nuclei. The red blood cells of mammals have nuclei when they are first formed, but they lose their nuclei before they enter the bloodstream.

2 TEACH

MOTIVATION/Software

The Cell: Examination, Structure, and Function, Queue, Inc.

MOTIVATION/Demonstration

Use a projector to show cell parts of both a plant and an animal cell. Prepared slides of frog blood and onion root tip are usually available.

TEACH

Concept Development

► Some students may believe a cell wall and a cell membrane to be the same structure. Distinguish between the two, and continue to reinforce the difference as cells are studied.

► Explain that a cell wall does not determine what may enter or leave a cell.

► Point out that cells of fungi and some one-celled organisms also have cell walls.

► Explain that chromosomes carry the hereditary information from one generation of cells to the next.



Cooperative Learning: Divide the class into cooperative groups of six. Have each group be responsible for learning the functions of two cell parts. Once each group has learned its cell parts, have the groups reshuffle and form new groups. Each person in the new group is responsible for explaining the functions of the cell parts he or she has become an "expert" on.

Student Journal

Students should research the work of Ernest E. Just and write a report on his contributions to the study of cell parts.

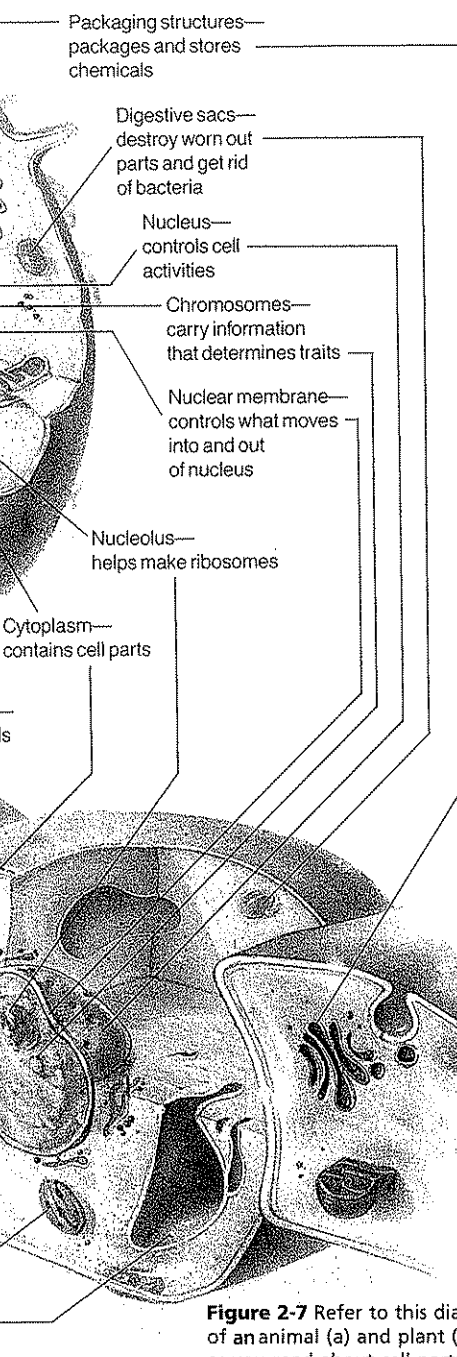


Figure 2-7 Refer to this diagram of an animal (a) and plant (b) cell as you read about cell parts and their jobs.

2:2 Cell Parts and Their Jobs

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SKILL

2

SKILL: INTERPRET DIAGRAMS

Chapter 2

For more help, refer to the Skill Handbook, pages 706-711. Use with Section 2:2.

PLANT AND ANIMAL CELLS

Diagrams in a textbook give information just as words do. They help make the meanings of words clear. Study Figure 2-7 with help you understand Section 2:2.

Use Section 2:2 and Figure 2-7 to complete the table below. In the first column, list all the words in Section 2:2 that are printed in bold type. In the second column, list where in the cell each cell part is located. In the third column, list the functions of each cell part.

Cell part	Location	Function(s)
cell membrane	around the cell	gives the cell shape, controls what moves into and out of the cell
nucleus	near the center	controls most of the cell's activities
nuclear membrane	around the nucleus	allows materials to move into and out of the nucleus
nucleolus	in the nucleus	makes ribosomes
chromosomes	in the nucleus	determine what traits a living thing will have
cytoplasm	throughout the cell	makes up most of the cell
ribosomes	in the cytoplasm	where proteins are made
mitochondria	in the cytoplasm	produce energy
vacuole	in the cytoplasm	stores food, water, and minerals
centrioles	in the cytoplasm	help cell reproduction
chloroplasts	in the cytoplasm of plant cells	trap energy for food making
cell wall	surrounds the plant cell	protects and supports the plant cell

OPTIONS



Plant and Animal Cells/Transparency Package, number 2a. Use color transparency number 2a as you teach the parts of cells.



Skill/Teacher Resource Package, p. 2. Use the Skill worksheet shown here for students to interpret diagrams of plant and animal cells.

TEACH

Concept Development

► Explain that cytoplasm consists of many types of proteins and other large molecules.

► Point out that mitochondria are most numerous in cells that are active in some way, such as muscle cells and liver cells. In plants, mitochondria are numerous in cells that transport water against the force of gravity.

Idea Map

Have students use the idea map as a study guide to the major concepts of this section.

Guided Practice

Have students write down their answers to the margin question: They are the cell parts where proteins are made.

GLENCOE TECHNOLOGY



The Secret of Life
Animal Cell



Plant Cell



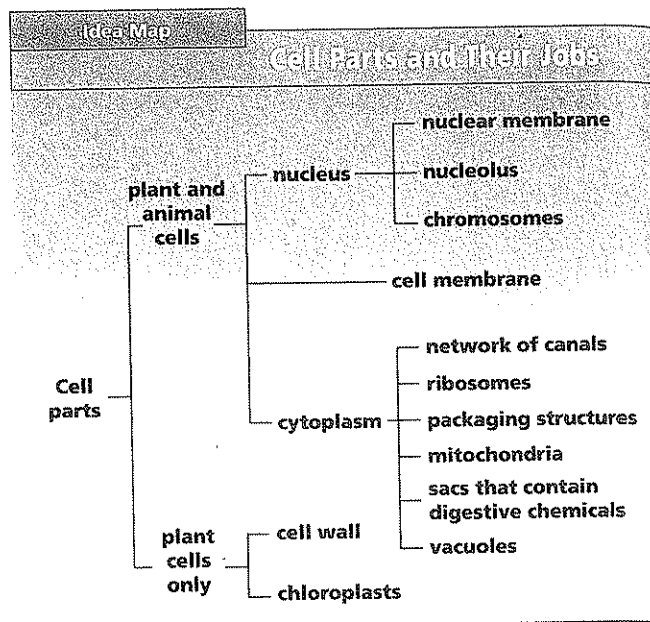
The Nucleus



Ribosomes



Study Tip: Use this idea map as you study cell parts and their jobs. Remember that only plant cells have cell walls and chloroplasts, and only animal cells have centrioles. All cells have the other cell parts shown in the idea map.



What is the job of the ribosomes?

First, the cytoplasm contains a network of canals that help move material around inside the cell. The canals connect the nuclear membrane and the cell membrane.

A second cell part found in the cytoplasm is the ribosome. **Ribosomes** are cell parts where proteins are made. Large numbers of ribosomes can be found along the canal network, where they are made. Ribosomes can also be found throughout the cytoplasm.

A third cell part found in the cytoplasm is a structure that packages and stores chemicals to be released from the cell. Large numbers of these packaging structures are found in cells that make saliva. Why do you suppose this is so? Large amounts of saliva are needed to break down the foods you eat.

Fourth, the cytoplasm contains rod-shaped bodies called mitochondria (mite uh KAHN dree uh). The **mitochondria** are cell parts that produce energy from food that has been digested. Mitochondria are often called "powerhouses" of the cell because they produce so much energy.

Small sacs that contain digestive chemicals are a fifth structure found in the cytoplasm. The chemicals made in these sacs break down large molecules. They get rid of



Bio Tip

Health: Hair is not made of cells. It is made of protein that is secreted by hair follicle cells. Hair follicle cells surround the root of the hair.

OPTIONS

What Cell Parts Can You See With the Microscope? *Lab Manual*, pp. 13-16. Use this lab as an extension to studying the parts of cells.

disease-causing bacteria that enter the cell. They also destroy worn-out cell parts and form products that can be used again.

Sixth, most cells have vacuoles (VAK yuh wolz) within the cytoplasm. A **vacuole** is a liquid-filled space that stores food, water, and minerals. Vacuoles also store wastes until the cell is ready to get rid of them. In most plant cells, the vacuole takes up a large amount of space within the cell. The fluid inside the vacuole helps to support the plant.

Centrioles (SEN tree olhz), a seventh structure within the cytoplasm, are located near the nucleus in animal cells but not in plant cells. **Centrioles** are cell parts that help with cell reproduction. They exist in pairs in the cell.

The cytoplasm of plant cells contains an eighth cell part, chloroplasts (KLOR uh plasts). **Chloroplasts** are cell parts that contain the green pigment, chlorophyll. Chlorophyll traps energy from the sun. Plants use this energy to make food. Chloroplasts give plants their green color.

The cells of plants, algae, fungi, and some bacteria have cell walls. Animal cells do not have cell walls. The **cell wall** is a thick outer covering outside the cell membrane. It protects and supports the cell.

The cell wall often remains after the rest of the cell has died. Wood is made of the walls of dead cells. What did Robert Hooke see when he looked at cork cells?

Skill Check

Understand science words: chloroplast.
The word part *chloro* means green. In your dictionary, find three words with the word part *chloro* in them. For more help, refer to the *Skill Handbook*, pages 706-711.

TEACH

Concept Development

► Explain that in unicellular organisms, food may be digested within certain vacuoles.

Check for Understanding

Use the overhead projector and transparency of a typical cell to point out each cell part and where it is located in the cell. Have students identify each part and give its function.

Reteach

Write the function of each cell part on a 3 x 5 card. Have a student draw a card, read the function, name the cell part, and tell where the cell part is located in the cell.

Independent Practice

Study Guide/Teacher Resource Package, p. 9. Use the Study Guide worksheet shown at the bottom of this page for independent practice.

GLENCoe TECHNOLOGY



Videotape

The Secret of Life
What's in Stetter's Pond: The Basics of Life

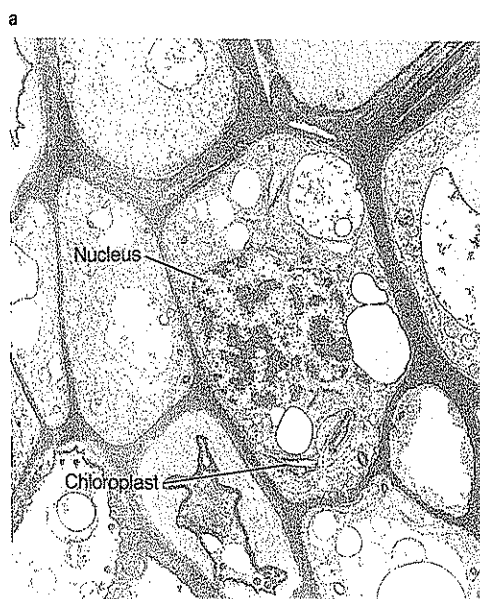


Figure 2-8 A plant cell magnified about 5000 times (a) and an animal cell magnified about 1900 times (b) are shown here. Note the labeled structures.

APPLICATION

2

APPLICATION: ENVIRONMENT

CHAPTER 2

Name _____ Date _____ Class _____
Use after Section 2.1.

A CELL IS LIKE A CITY

To get an idea of how a cell works, compare it to a city. Both a city and a cell act as their own environments, with many parts working together. Parts of the cell are like parts of the city. In some ways, cell parts and city parts are alike in the way they work.

Try to figure out which parts of the cell are like which parts of the city. First, write the functions of the cell parts listed below. Then, look at the list of parts of a city. Think about how each part of the city works. Finally, next to each cell part, write the letter that goes with the part of the city that has the most similar function.

- Cell membrane gives the cell shape and holds in cytoplasm; controls what moves into and out of the cell.
- Nucleus controls most of the cell's activities; determines how and when proteins are made; passes traits from parents to offspring.
- Network of canals helps move material around inside the cell.
- Ribosomes are cell parts where proteins are made.
- Packaging structures package and store chemicals to be released from cell.
- Mitochondria produce energy from food that has been digested.
- Cells that contain digestive enzymes break down large molecules; destroy bacteria; destroy worn-out cell parts; form new products that can be used again.
- Vacuoles store food, water, and minerals; store wastes until cell gets rid of them.

Parts of a City

- power plant
- city hall with planning department
- storage company
- streets
- packaging center
- factory
- working company

STUDY GUIDE

9

STUDY GUIDE

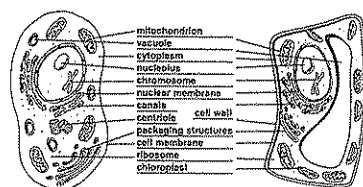
CHAPTER 2

Name _____ Date _____ Class _____

CELL PARTS AND THEIR JOBS

In your textbook, read about cell parts and their jobs in Section 2.1.

1. Label the parts of these two cells in the space provided.



- Read the descriptions of cell parts below and write in the name of the cell part. Use the color indicated to shade the pictures above.
 - Use red for the part that gives the cell shape and holds the cytoplasm. **cell membrane**
 - Use green for parts that make food. **chloroplasts**
 - Use brown for the thick outer covering that protects and supports the cell. **cell wall**
 - Use blue for the part that stores substances. **vacuole**
 - Use black for parts that get energy from food. **mitochondria**
 - Use purple for parts that carry hereditary information. **chromosomes**
 - Use pink for the cell part that helps with cell reproduction. **centriole**
 - Use orange for the parts that package and store chemicals. **packaging structures**
 - List two cell parts found only in a plant cell. **chloroplasts, cell wall**
 - Where in a cell do most chemical reactions take place? **in the cytoplasm**

OPTIONS



Application/Teacher Resource Package, p. 2. Use the Application worksheet shown here to teach how a cell works.



Overview

In this lab, students use the light microscope to compare plant and animal cells. They will stain and observe cell parts.

Objectives: Upon completing this lab, students will be able to (1) use a microscope more efficiently, (2) prepare stained cells, (3) compare the parts of plant and animal cells that are visible with the light microscope.

Time Allotment: 40 minutes

Preparation

▶ **Alternate Materials:** Lettuce can be substituted for *Elodea*.

Lab 2-2 worksheet/Teacher Resource Package, pp. 7-8.

Teaching the Lab

▶ **Caution** students to rub their cheeks gently when obtaining cheek cells with the toothpicks. Also instruct them to properly dispose of the toothpick after use.

Cooperative Learning: Have students work in pairs. For more information, see pp. 22T-23T in the Teacher Guide.

▶ **Troubleshooting:** Too many cheek cells on the slide will result in not being able to see the cells.

ASSESSMENT

Performance: Provide students with prepared slides of other plant and animal cells. Ask students to observe the slides under low power and then high power. Students should determine which slides are of plants and which are of animals. Ask students to support their choices.

Problem: How do animal and plant cells differ?

Materials

- light microscope
- 2 glass slides
- 2 coverslips
- dropper
- methylene blue stain
- toothpick, flat type
- Elodea* leaf
- water

Skills

observe, compare, use a microscope

Procedure

- Copy the data table.
- Put a drop of stain on a slide. Gently scrape the inside of your cheek with a toothpick. **CAUTION:** Do not scrape hard enough to injure your cheek.
- Rub the toothpick in the stain. Break the toothpick in half and discard it as your teacher directs.
- Cover the slide with a coverslip.
- Use a microscope:** Look at the cheek cells under low power, then high power.
- Locate the nucleus, cytoplasm, and cell membrane. Fill in the table by putting a check mark in the box if the cell part can be seen.
- Draw and label the nucleus, cytoplasm, and cell membrane of a cheek cell.
- Prepare a slide of an *Elodea* leaf. Put an *Elodea* leaf in a drop of water on a slide. Add a coverslip.
- Look at the *Elodea* cells under low power, then high power.
- Locate the cell wall, chloroplasts, nucleus, and cytoplasm. Fill in the table.
- Draw and label the cell wall, chloroplasts, nucleus, and cytoplasm of an *Elodea* cell.

CELL PART	CHEEK CELL PARTS PRESENT	ELODEA CELL PARTS PRESENT
Cytoplasm	✓	✓
Nucleus	✓	✓
Chloroplast		✓
Cell wall		✓
Cell membrane	✓	✓

Data and Observations

- Describe the shape of a cheek cell.
- Describe the shape of an *Elodea* cell.
- Compare:** What parts did you see in both cells?
- What parts are found in plant cells that are absent in animal cells?

Analyze and Apply

- What do the cell parts found only in plant cells do?
- Is the nucleus always found in the center of the cell?
- Which part of an animal cell gives shape to the cell?
- Which parts of a plant cell give shape to the cell?
- Why are stains such as methylene blue used when observing cells under the microscope?
- Apply:** Why don't animal cells have chloroplasts? (HINT: How do animals get energy?)

Extension

Observe other plant and animal cells under the microscope. How are they different from cheek cells and *Elodea* cells? How are they alike?

ANSWERS

Data and Observations

- round and uneven
- rectangular
- cytoplasm, nucleus, cell membrane
- chloroplast, cell wall

Analyze and Apply

- Chloroplasts trap energy from the sun and make food; the cell wall protects the cell and gives it support.
- no
- cell membrane

- cell wall
- to make the cell parts visible
- Animals get energy from the food they eat.

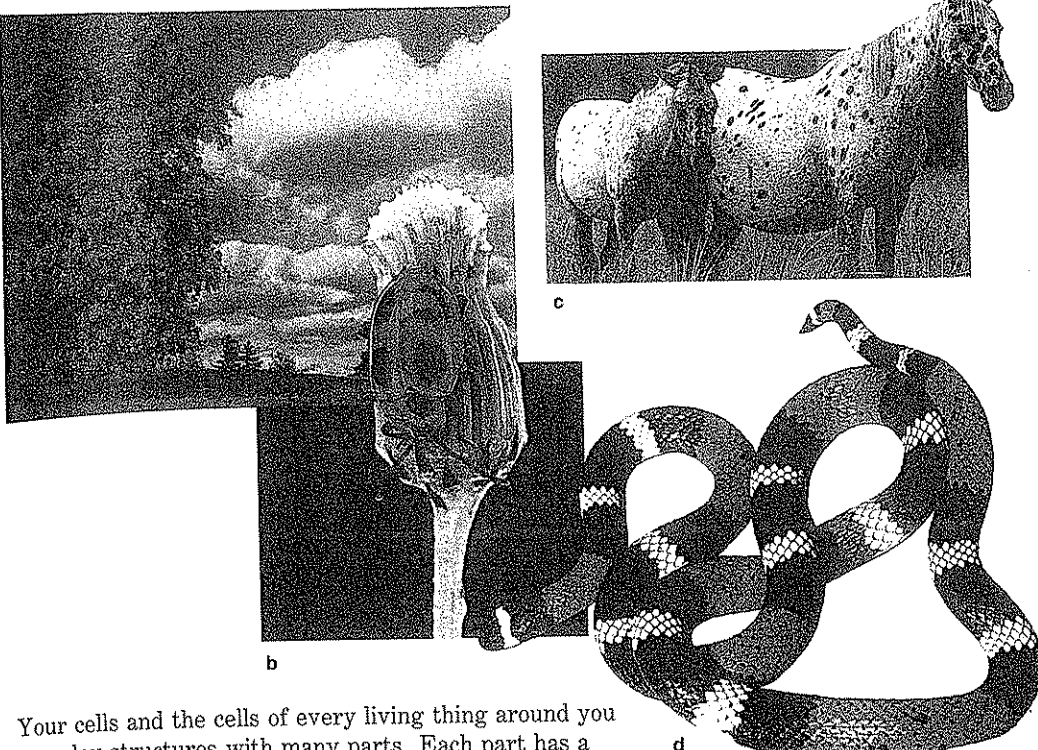


Figure 2-9 The maple tree (a), ladybug (b), horse (c), and snake (d) are all made of cells.

Your cells and the cells of every living thing around you are complex structures with many parts. Each part has a function that is important to the life of the cell. All of the living things in Figure 2-9 are made of cells. What other living things can you name that are made of cells?

Check Your Understanding

- Which cell part is being described?
- (a) helps keep cytoplasm inside
 - (b) controls most of the cell's activities
 - (c) a liquid-filled space for storage
 - (d) green parts of plants that trap energy from the sun
 - (e) clear, jellylike material in which most of the cell's chemical reactions take place
- Name two cell parts found in plant cells that are not found in animal cells.
- Why are mitochondria called "powerhouses" of the cell?
- Critical Thinking:** How do mitochondria and chloroplasts differ?
- Biology and Writing:** Write three sentences describing the cell parts that make up a wooden table.

TEACH

Check for Understanding

Have students respond to the first three questions in Check Your Understanding.

Reteach



Reteaching/Teacher Resource Package, p. 5. Use this worksheet to give students additional practice comparing plant cell and animal cell structures.

Extension: Assign Critical Thinking, Biology and Writing, or some of the **OPTIONS** available with this lesson.

3 APPLY

Connection: Language Arts

Have students list the cell parts and use a dictionary to find the origin and meaning of each word.

4 CLOSE

Make a Model

Have students work in pairs with clay and paints to make a model of either a plant or an animal cell.

Answers to Check Your Understanding

6. (a) cell membrane, (b) nucleus, (c) vacuole, (d) chloroplast, (e) cytoplasm
7. cell wall and chloroplast
8. they produce so much energy
9. Chloroplasts trap energy from the sun and change it into food energy. Mitochondria produce energy from food that has been digested.
10. Answers will vary. Students should include cell walls in their answers.

RETEACHING

5

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RETEACHING **CHAPTER 2**

Name _____ Date _____ Class _____

Use with Section 2:2.

PLANT CELL AND ANIMAL CELL STRUCTURES

GLENCOE TECHNOLOGY



Videodisc
The Secret of Life
Diffusion



Osmosis

